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OFFICE OF NAVAL RESEARCH  
PUBLICATIONS/PATENTS/PRESENTATIONS/HONORS REPORT  
FOR  
1 OCTOBER 1992 THROUGH 30 SEPTEMBER 1993  
CONTRACT N00014-89-J-1070

**SIGNAL PROCESSING IN THE LINEAR STATISTICAL MODEL**

PRINCIPAL INVESTIGATOR: Louis L. Scharf, 303/492-8283  
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1 October 1992 through 30 September 1993

R&T Number:

Contract/Grant Number: N00014-89-J-1070

Contract/Grant Title: Signal Processing in the Linear Statistical Model

Principal Investigators: Louis L. Scharf and C. T. Mullis

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- a. Number of Papers Submitted to Refereed Journals but not yet published: 9 (list attached)
- b. Number of Papers Published in Refereed Journals: 1 (list attached)
- c. Number of Books/Chapters Submitted but not yet Published: 0 (list attached)
- d. Number of Books or Chapters Published: 0
- e. Number of Technical Reports & Non-Refereed Papers: 0
- f. Number of Patents Filed: 0
- g. Number of Patents Granted: 0
- h. Number of Invited Presentations at Workshops or Professional Society Meetings: 2 (list attached)
- i. Number of Contributed Presentations at Workshops or Professional Society Meetings: 6 (list attached)
- j. Honors/Awards/Prizes for Contract/Grant Employees: 2 (list attached)
- k. Total number of Graduate Students and Post-Docs Supported at Least 25% This Year Under This Grant: Graduate Students: 2 Post-Docs: 1

Of these:

# Female Graduate Students: 0 # Female Post-Docs: 0  
# Minority Graduate Students: 0 # Minority Post-Docs: 0

Note: Minorities includes African Americans, Hispanics, American Indians, and Aleutians only.

- l. (added by PI) Work in Progress: 5

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**a. Papers submitted to refereed journals (and not yet published):**

M. P. Clark and L. L. Scharf, "Two-Dimensional Modal Analysis Based on Maximum Likelihood," accepted and to be published in *IEEE Trans Signal Proc* (June 1994).

R. T. Behrens and L. L. Scharf, "Signal Processing Applications of Oblique Projection Operators," accepted and to be published in *IEEE Trans Signal Proc* (1993).

L. L. Scharf and S. T. Voran, "Polar Coordinate Quantizers," accepted and to be published in *IEEE Trans Signal Proc* (1994).

A. J. Thorpe and L. L. Scharf, "Data Adaptive Reduced-Rank Methods for Solving Least Squares Problems," submitted to *IEEE Trans Signal Proc* (1994).

M. Vis and L. L. Scharf, "A Note on Recursive Maximum Likelihood for Autoregressive Modeling," submitted to *IEEE Trans Signal Proc* (September 1993).

L. L. Scharf and B. Friedlander, "Matched Subspace Detectors," submitted to *IEEE Trans Signal Proc* (July 1993).

K. Aas and C. T. Mullis, "Minimum Mean-Squared Error Transform Coding and Subband Coding," submitted to *IEEE Trans Signal Proc* (January 1993).

L. L. Scharf and S. T. Voran, "Noise Rejecting Quantizers," submitted to *IEEE Trans Signal Proc* (January 1993).

J. K. Thomas, L. L. Scharf, and D. W. Tufts, "Probability of Subspace Swap in the SVD," submitted to *IEEE Trans Signal Proc* (July 1993).

**b. Papers published in refereed journals:**

M. P. Clark and C. T. Mullis, "Quadratic Estimation of the Power Spectrum using Orthogonal Time-Division Multiple Windows," *IEEE Trans on Signal Proc* SP-41:1 (January 1993).

**c. Books (and sections thereof) submitted for publication:**

None.

**d. Books (and sections thereof) published:**

None.

**e. Technical reports and nonrefereed papers:**

None.

**f. Patents filed:**

None (one in preparation).

**g. Patents granted:**

None.

**h. Invited presentations at topical or scientific/technical society conferences:**

L. L. Scharf and B. Friedlander, "Matched Subspace Detectors," 1993 Workshop on Underwater Acoustic Signal Processing, Kingston, RI (September 1993).

L. L. Scharf and L. T. McWhorter, "Quadratic Estimators of Covariance: Theory and Application," to be presented at SYSIN, Copenhagen (July 1994).

**i. Contributed presentations at topical or scientific/technical society conferences:**

M. P. Clark and L. L. Scharf, "Frequency-Wavenumber Spectrum Analysis," *Proc 1992 Workshop on Statistical and Array Processing*, Victoria, BC (October 1992).

M. Spurbeck, "Causal Wiener Filtering of Periodically Correlated Sequences," SIAM Conf on Linear Algebra, Signal Systems, and Controls, Seattle (August 1993).

M. P. Clark and L. L. Scharf, "Efficient Frequency-Wavenumber Spectrum Estimation using Sliding Time-Division Windows," 1992 Asilomar Conference on Signals, Systems, and Computers, Pacific Grove, CA (November 1992).

J. K. Thomas, L. L. Scharf, and D. W. Tufts, "Probability of Subspace Swap in the SVD," to be presented at 27th Annual Asilomar Conf on Signals, Systems, and Computers, Asilomar, CA (October 1993).

L. L. Scharf and B. Friedlander, "Matched Subspace Detectors," to be presented at 27th Annual Asilomar Conf on Signals, Systems, and Computers, Asilomar, CA (October 1993).

L. L. Scharf, "Geometrical Ideas in Detection, Estimation, and Time Series Analysis," to be presented at 7th SP Workshop on Statistical Signal and Array Processing, Quebec City (June 1994).

**j. Honors/awards/prizes:**

C. T. Mullis promoted to full Professor effective January 1, 1993.

L. L. Scharf appointed National Distinguished Lecturer for IEEE Society for Signal Processing (1993-1994).

**k. Graduate students and post-doctorals supported under the contract for the year ending 1 October 1993: (no female/minority)**

John K. Thomas

Mark Spurbeck

Knut Aas (post-doctoral)

**l. Work in Progress:**

F. Ziel and C. T. Mullis, "Discrete Wavelet Frames and Filter Banks," to be submitted to *IEEE Trans Signal Proc.*

J. K. Thomas, "Automatic Bandwidth Estimation in Spectral Analysis," to be submitted.

M. Spurbeck, "Wavelet Decompositions of  $\ell^2$ ," to be submitted.

L. L. Scharf and M. Vis, "Signal Subspace MUSIC Algorithm," to be submitted.

J. K. Thomas, "Nonstationary Spectrum Analysis," to be submitted.